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Short Communication / *Kısa Bilimsel Çalışma*

The coccidian parasites (Eimeridae) of *Spalax leucodon* Nordmann (Mole-Rat)

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Summary: Twenty-three mole-rats of the *Spalax leucodon* Nordmann superspecies were collected from Eryaman district of Ankara in Turkey. Faeces samples were examined for coccidian oocysts and the 23 examined animals (100%) were determined to be infected with 2-8 species representing 10 species of eimerians and 1 species of isosporan. The prevalence of coccidian in the population of herbivorous mole-rats sampled is reported as 78.2% *Eimeria elliptica*, 73.9% *E.maralikiensis*, 65.2% *E.spalacis*, 52.1% *E.torosicum*, 47.8% *E.turkmenica*, 43.4% *E.lalahanensis*, 30.4% *E.talikiensis*, 21.7% *E.oytuni*, 13% *E.celebii*, 4.3% *E.tuzdili*, 4.3% *Isospora anatolicum*. As a result, *E.lalahanensis*, *E.tuzdili*, *E.spalacis*, *E.elliptica*, *E.turkmenica*, *I.anatolicum*, as well as *E.maralikiensis*, *E.talikiensis*, *E.oytuni*, *E.celebii*, *E.torosicum* were determined in *S.leucodon* in Turkey. In addition, *E.maralikiensis* and *E.talikiensis* were reported from *S.leucodon* for the first time in Turkey. Furthermore the species which were found in *S.ehrenbergi* such as *E.oytuni*, *E.celebii*, *E.torosicum* were also reported from *S.leucodon* for the first time in this study.

Key words: *Eimeria, Isospora*, mole-rats (*Spalax leucodon*).

Spalax leucodon Nordmann türü kör farelerde coccidian (Eimeridae) parazitler

Özet: Bu çalışma, Ankara'nın Eryaman yöresinden yakalanan 23 *Spalax leucodon* türü kör farede coccidian oocystlerinin tespiti amacıyla yapılmıştır. Muayene edilen 23 kör farenin tamamı (%100) 2-8 türle, 10 farklı *Eimeria* ve 1 *İsospora* oocysti ile enfekte bulunmuştur. Kör farelerden elde edilen dışkı örneklerinde %78.2 *Eimeria elliptica*, %73.9 *E.maralikiensis*, %65.2 *E.spalacis*, %52.1 *E.torosicum*, %47.8 *E.turkmenica*, %43.4 *E.lalahanensis*, %30.4 *E.talikiensis*, %21.7 *E.oytuni*, %13 *E.celebii*, %4.3 *E.tuzdili*, %4.3 *Isospora anatolicum* rapor edilmiştir. Sonuç olarak *S.leucodon*'da daha önce Türkiye'den bildirilen *E.lalahanensis*, *E.tuzdili*, *E.spalacis*, *E.elliptica*, *E.turkmenica* ve *I.anatolicum* türleri ile ülkemizde henüz bildirilmemiş olan *E.maralikiensis* ve *E.talikiensis* türleride bulunmuştur. Ayrıca yine bu çalışmada *S.ehrenbergi*'de bulunan *E.oytuni*, *E.celebii*, *E.torosicum* türleri *S.leucodon*'da ilk defa tespit edilmiştir.

Anahtar sözcükler: *Eimeria*, *Isospora,* kör fare (*Spalax leucodon*).

In 5 previous articles 19 new species of *Eimeria* and 2 new species of *Isospora* have been described in herbivorous mole-rats, *Spalax leucodon* Nordmann and *Spalax ehrenbergi* Nehring of the family Spalacidae. *Eimeria maralikiensis*, *E.talikiensis*, *E.leucodonica* and *E.lalahanensis*, *E.tuzdili*, *E.spalacis*, *E.elliptica*, *E.turkmenica* and *Isospora anatolicum* were first reported from herbivorous mole-rats of *S.leucodon* (4, 5). *Eimeria urfensis*, *E.adiyamanensis*, *E.haranica*, *E.marasensis*, *E.oytuni*, *E.celebii*, *E.torosicum, E.microspalacis, E.spalacensis*, *E.anzanensis*, *E.carmelensis* and *Isospora spalacensis* were first described from herbivorous mole-rats of *S.ehrenbergi* (1-3). *Eimeria tuzdili*, *E.spalacis*, *E.elliptica*, *E.turkmenica* and *I. anatolicum* species have been revealed from herbivorous mole-rats of *S.ehrenbergi* (1-3).

This study was aimed to investigate the coccidian parasites of *Spalax leucodon* Nordmann (mole-rat) in Eryaman district of Ankara in Turkey.

Twenty-three herbivorous mole-rats, *Spalax leucodon* Nordmann, trapped from Eryaman district of Ankara in Turkey were examined for coccidian parasites. Faecal samples were placed separately to form a thin layer in petri dishes containing 2.5% (w/v) potassium dichromate ($K_2Cr_2O_7$), mixed thoroughly, and kept at 20-22°C to allow the oocysts to sporulate. The oocysts were examined periodically to determine sporulation. Oocysts were stored, measured in detail as described by Sayin et al. (4). The prevalence of coccidian in the population of herbivorous mole-rats sampled is also reported.

All coccidian oocysts were distinguished on structural basis [Such as: note characteristic features including the

oocysts shape, size, Length/Width ratios, the oocysts wall layer (number of layers, outer and inner character, size and colour), note presence/absence of the micropyle, micropyle cap, polar granules, oocyst residuum; note characteristic features including the sporocysts shape, size, stieda body; residual body, granules; sporozoites shape and refractile body]. Oocysts were concentrated by flotation in Sheather's sugar solution and examined with an Olympus microscope under 1000x and 400x magnification. At least 25-50 oocysts (or found in) were measured with an ocular micrometer.

All the 23 herbivorous mole-rats examined were infected with coccidian oocysts (100%). Ten species of *Eimeria* and 1 species *Isospora* were found in these animals (Table 1). The coccidian species identified and the prevalence of these species in the population of the herbivorous mole-rats examined are indicated in Table 1. The prevalence in the population of herbivorous mole-rats sampled is reported as 78.2% *E.elliptica*, 73.9% *E. maralikiensis* (Figure 1), 65.2% *E.spalacis*, 47.8% *E.turkmenica*, 43.4% *E.lalahanensis*, 30.4% *E.talikiensis* (Figure 2), 4.3% *Etuzdili*, 4.3% *I.anatolicum*, 52.1% *E.torosicum* (Figure 3), 21.7% *E.oytuni* (Figure 4), 13% *E.celebii* (Figure 5). As also understood from Table 1, *E.elliptica*, *E.maralikiensis*, *E.spalacis* and *E.torosicum* are the species which occurred most frequently in the 23 animals examined.

Table 1. The prevalence of coccidian parasites (*Spalax leucodon and Spalax ehrenbergi* species) in 23 herbivorous mole-rats (*Spalax leucodon*) fecal specimens
Tablo 1. Dışkı örneği toplanan 23 kör faredeki coccidian parazit (*Spalax leucodon and Spalax ehrenbergi* türleri) prevalansı

Species	The number of infected mole-rats	Percentage of prevalence (x/n)
Spalax leucodon Species		
Eimeria elliptica	18	78.2
Eimeria maralikiensis	17	73.9
Eimeria spalacis	15	65.2
Eimeria turkmenica	11	47.8
Eimeria lalahanensis	10	43.4
Eimeria talikiensis	7	30.4
Eimeria tuzdili	1	4.3
Isospora anatolicum	1	4.3
Spalax ehrenbergi Species		
Eimeria torosicum	12	52.1
Eimeria oytuni	5	21.7
Eimeria celebii	3	13.0

x: The number of infected mole-rats
n: Total number of mole-rats (n:23)

Twenty-three examined animals (100%) were infected with 2-8 species representing 10 species of eimerians and 1 species of isosporan (Table 2). In Table 2, an analysis of the prevalence of different species is given, indicating that multiple species were common, but these most frequently consisted of 5 species. One species was not observed in mole-rats.

Table 2. The number of species of coccidan parasites occurring in individual herbivorous mole-rats fecal specimens
Tablo 2. Kör farelerdeki dışkı örneklerinde coccidian parazit türü sayısı

The number of species present in specimens	2	3	4	5	6	7	8
The number of infected mole-rats	3	4	3	8	3	1	1
Percentage of specimens (x/n)	13	17.3	13	34.7	13	4.3	4.3

x: The number of infected mole-rats
n: Total number of mole-rats (n:23)

Earlier, 8 eimerian and 1 isosporan species were described from *S.leucodon*, and 15 eimerian and 2 isosporan species were described from *S.ehrenbergi*: Veisov (5) described 3 new eimerian species from 14 *S.leucodon* in U.S.S.R.; Sayin et al. (4) described 5 new eimerian species, and 1 new isosporan species from 96 *S.leucodon* trapped in Turkey; Sayin (3) described 7 new eimerian species and 4 new eimerian host species from 41 *S.ehrenbergi*, also from Turkey; Golemansky and Darwish (2) described 1 new eimerian species and 1 new host isosporan from 29 *S.ehrenbergi* collected in Syria. Couch et al. (1) described 3 new eimerian species and 1 new isosporan species from 45 *S.ehrenbergi* in Israel.

Recently, only two articles have been published on the coccidian of herbivorous mole-rats of *S.leucodon* Nordmann. Eight new species of *Eimeria* and 1 new species of *Isospora* were described by Veisov (5) and Sayin et al. (4), their prevalence were *E.maralikiensis* (35.7%), *E.talikiensis* (14.2%), *E.leucodonica* (7.1%); *E.lalahanensis* (10.4%), *E.tuzdili* (3.1%), *E.spalacis* (93.7%), *E.elliptica* (8.4%), *E.turkmenica* (1.1%). Prevalence was determined as 73.9% *E.maralikiensis*, 30.4% *E. talikiensis*, 43.4% *E.lalahanensis*, 4.3% *E.tuzdili*, 65.2% *E.spalacis*, 78.2% *E.elliptica*, 47.8% *E.turkmenica* as well as 4.3% *I.anatolicum* in this study. Excluding *E.elliptica*, the prevalence of these coccidians were determined to be higher than previous reports (4, 5). *Eimeria leucodonica* was not found in the 23 herbivorous mole-rats examined in this study.

Eimeria oytuni (4%), *E.celebii* (2%), *E.torosicum* (4%) were first found in Turkey by Sayin (3) from herbivorous mole-rats of *S.ehrenbergi* Nehring. In this study, *E.oytuni* (21.7%), *E.celebii* (13%), *E.torosicum* (52.1%) have also been reported for the first time from herbivorous mole-rats of *S.leucodon* Nordmann. The

prevalence of these *Eimeria* species were higher in the original host *S.ehrenbergi* as compared to the earlier report. However, these species resembled the original host species in the morphological and basic structural features of oocysts. Similar to the species which were determined in herbivorous mole-rats of *S.leucodon* Nordmann such as *E.tuzdili* (3), *E.spalacis* (2, 3), *E.elliptica* (1, 3), *E.turkmenica* (3) and *I.anatolicum* (2) were reported in herbivorous mole-rats of *S. ehrenbergi* Nehring. In previous studies, certain coccidian parasites were common in both *S.leucodon* and *S.ehrenbergi*. It is not surprising that *E.oytuni*, *E.celebii*, *E.torosicum* may be common in both hosts.

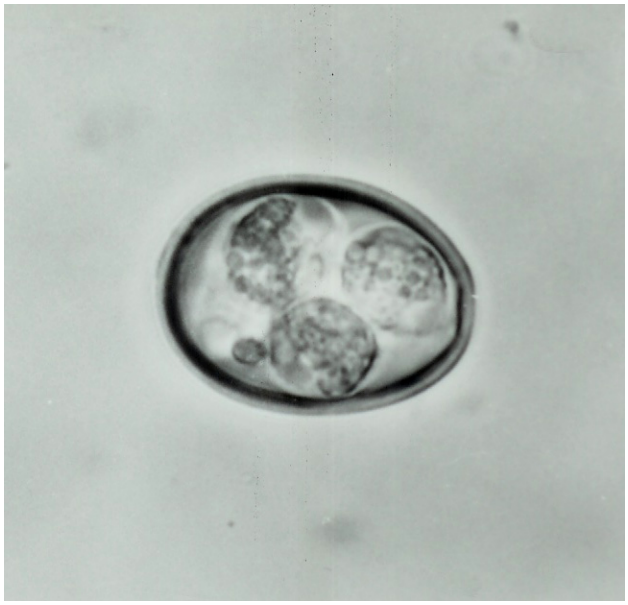

Figure 1. *Eimeria maralikiensis*
Şekil 1. *Eimeria maralikiensis*

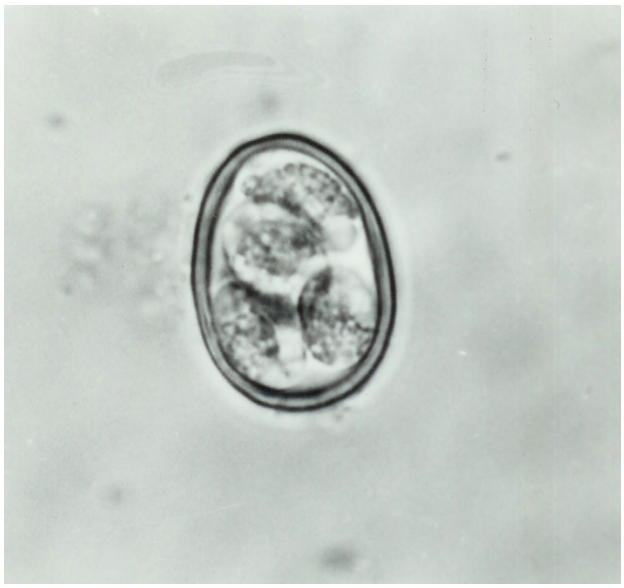

Figure 2. *Eimeria talikiensis*
Şekil 2. *Eimeria talikiensis*

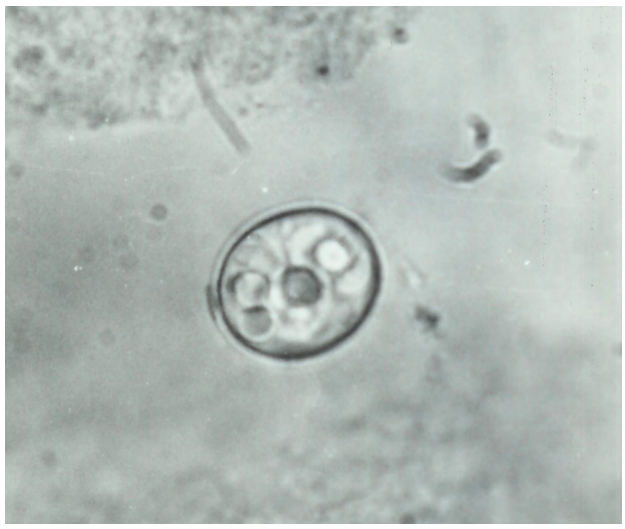

Figure 3. *Eimeria torosicum*
Şekil 3. *Eimeria torosicum*

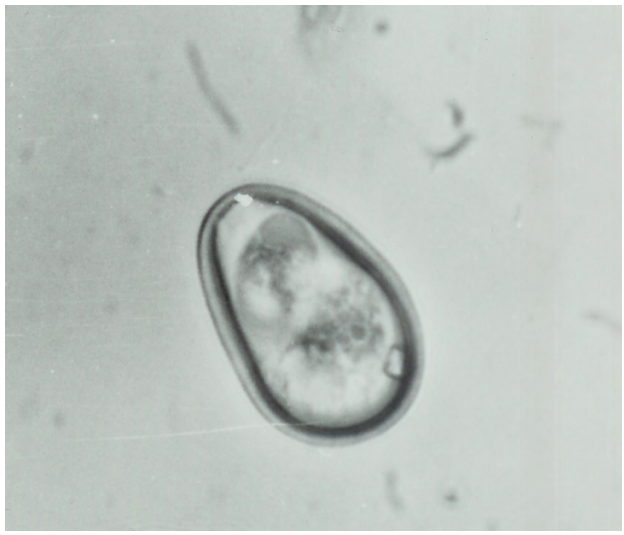

Figure 4. *Eimeria oytuni*
Şekil 4. *Eimeria oytuni*

Figure 5. *Eimeria celebii*
Şekil 5. *Eimeria celebii*

As a result, *E.lalahanensis*, *E.tuzdili*, *E.spalacis*, *E.elliptica*, *E.turkmenica*, *I.anatolicum*, as well as *E.maralikiensis*, *E.talikiensis*, *E.oytuni*, *E.celebii*, *E.torosicum* were determined in *S.leucodon* in Turkey. In addition, *E.maralikiensis* and *E.talikiensis* were reported from *S.leucodon* for the first time in Turkey. Furthermore the species which were found in *S.ehrenbergi* such as *E.oytuni*, *E.celebii*, *E.torosicum* were also reported from *S.leucodon* for the first time in this study.

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References

1. **Couch L, Duszynski DW, Nevo E** (1993): *Coccidia (Apicomplexa), genetic diversity, and enviromental unpredictability of four chromosomal species of the subterranean superspecies Spalax ehrenbergi (mole-rat) in Israel*. J Parasitol, **79**, 181-189.
2. **Golemansky VG, Darwish AI** (1992*): The coccidian parasites (Apicomplexa, Coccidia) of the herbivorous mole-rat Spalax (Microspalax) ehrenbergi*. Acta Protozool, **31**, 173-176.
3. **Sayın F** (1980): *Eimeriidae of the herbivorous mole-rats*, *Spalax ehrenbergi Nehring*. J Protozool, **27**, 364-367.
4. **Sayın F, Dinçer Ş, Meriç M** (1977): *Coccidia (Protozoa: Eimeridae) of the herbivorous mole-rats*, *Spalax leucodon Normdan*. J Protozool, **24**, 210-212.
5. **Veisov A** (1975): Tri novyky vida koktsidii roda Eimeria is gornogo ili belozobugo slepysha Spalax leucodon Nordman (1840) [Three new species of coccidia of the genus Eimeria from Spalax leucodon Nordman (1840).]. Izvest Akad Nauk Azerbaid. SSR, Ser Biol Nauk, **4**, 82-84.

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